

JOSEPH ALLEN POTKAY, Ph.D.

CONTACT INFORMATION

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RESEARCH INTERESTS

Medical microsystems; MEMS; Microfluidics; Microfabricated artificial organs; Microchannel artificial lungs; Biocompatible sensor and actuator systems; Energy harvesting; Implantable power generators; Implantable pressure sensors.

EDUCATION

Ph.D. in Electrical Engineering	Dec 2006
University of Michigan	Ann Arbor, MI
Dissertation: <i>A Low-Power Pressure- and Temperature-Programmed Separation System for a Micro Gas Chromatograph</i>	
Thesis Advisor: <i>Kensall D. Wise, Ph.D.</i>	
M.S. in Electrical Engineering	May 2002
University of Michigan	Ann Arbor, MI
<i>Major/Minor: Circuits and Microsystems / Solid State Devices</i>	
	GPA 8.4/9.0 (A = 8.0)
B.S.E. in Computer Engineering	June 2000
University of Cincinnati	Cincinnati, OH
<i>Valedictorian</i>	GPA 4.0/4.0

POSITIONS AND EMPLOYMENT

2016 -	Adjunct Research Investigator, Electrical Engineering, University of Michigan
2013 -	Adjunct Research Investigator, Department of Surgery, University of Michigan
2012 -	Research Biomedical Engineer, VA Ann Arbor Healthcare System
2010 -	Investigator, Advanced Platform Technology Center – A VA Research Center of Excellence
2015 - 2016	Visiting Scholar, Electrical Engineering, University of Michigan
2011 - 2015	Research Assistant Professor, Department of Electrical Engineering and Computer Science, Case Western Reserve University
2006 - 2012	Research Biomedical Engineer, Louis Stokes Cleveland VA Medical Center
2006 - 2010	Associate Investigator, Advanced Platform Technology Center – A VA Research Center of Excellence
2000 - 2006	Research Assistant, Department of Electrical Engineering and Computer Science, University of Michigan
2002 - 2006	Teaching Assistant, EECS 425: Integrated Microsystems Laboratory, University of Michigan
2003 - 2004	President and Vice President, Student Leadership Committee, Center for Wireless Integrated Microsystems, University of Michigan
2002 - 2003	Mentor, Detroit Area Pre-College Engineering Program, Center for Wireless Integrated Microsystems, University of Michigan

2002	Educational chair, Student Leadership Committee, Center for Wireless Integrated Microsystems, University of Michigan
1998 - 1999	Computer Engineering Co-op, Compaq Computer Corporation, Shrewsbury, MA
1997 - 1998	Electrical and Computer Engineering Co-op, Keithley Instruments, Solon, OH

PROFESSIONAL EXPERIENCE

VA Ann Arbor Healthcare System July 2012 – Advanced Platform Technology Center (APT Center) Ann Arbor, MI *Investigator and Research Biomedical Engineer*

- Developing an independent research program in Advanced Medical Microsystems.
- Investigating artificial lung and kidney devices harnessing advantages at the micro and nano scale.
- Collaborating with local physicians and other research professionals and managing engineers in order to successfully advance the aforementioned projects and make them a clinical reality.

Louis Stokes Cleveland Veterans Affairs Medical Center Oct 2006 – Jun 2012 Advanced Platform Technology Center (APT Center) Cleveland, OH *Investigator and Research Biomedical Engineer*

- Developed an independent research program utilizing microsystems/MEMS and advanced sensor and actuator systems to benefit veteran health.
- Researched the use of MEMS and micromachining to fabricate a miniature artificial lung with high efficiency.
- Invented and investigated an implantable power sources that are capable of safely harvesting energy from the body. The device scavenged energy from arterial expansion and contraction.
- Conceived of and researched a smart vascular graft capable of being wirelessly interrogated.
- Collaborated with local physicians and other research professionals and managing engineers in order to successfully advance the aforementioned projects and make them a clinical reality.

University of Michigan Sep 2000 – Dec 2006 Research Assistant / Doctoral Research Ann Arbor, MI

- Dissertation Summary: Developed a low-power pressure-programmable separation system for a micro gas chromatograph (μ GC). This research: 1) used system-based design to develop a high-performance μ GC column, in an etched-back silicon-on-glass structure; 2) developed a low-power, low-mass, dielectric μ GC column with integrated heaters, temperature sensors and pressure sensors; 3) developed a low-power electrostatically latching thermopneumatic microvalve enabling pressure programming; 4) integrated the μ GC column and valve into the environmental monitor under development in the National Science Foundation's Engineering Research Center (ERC) in WIMS.
- Microfabrication: Gained a working knowledge of semiconductor and MEMS cleanroom processing and characterization including lithography, chemical vapor deposition (CVD), physical vapor deposition (PVD), thermal oxidation, plasma etching, wet etching, surface and thin-film metrology, electron beam microscopy, electroplating, stress measurement and management, and wafer bonding.
- System-Based Device Design: The column and valve were designed according to the constraints and performance of the entire μ GC system including the flow and pressure constraints of the micropump, dead volume, the flow requirements of the preconcentrator and sensor array, device interfacing and packaging, and targeted analysis time, sensitivity and power.
- Sensors and Actuators: Designed, fabricated, and tested various sensors and actuators including resistive temperature sensors, capacitive pressure sensors, capacitive position sensors, resistive heaters and a hybrid thermopneumatic and electrostatic actuator.

- Theory & Modeling: Developed and applied analytical models to the design of the column and valve and utilized them to gain a fundamental understanding of the device design and tradeoffs. Verified the theory using Finite Element Analysis (FEA) in ANSYS.
- System Integration and Collaboration: Assisted in the development of a microfabricated fluidic and electrical substrate for the integration of the various components of the environmental monitor. Collaborated with researchers in multiple disciplines including Chemistry, Aerospace Engineering, and Mechanical Engineering in order to facilitate device interfacing and integration into the system. Required team cooperation, clear communication of device specifications, and individual accountability.
- Test Equipment Design and Construction: Specified, procured, calibrated and operated equipment for testing the flow, pressure, flow, speed and power of MEMS devices. Utilized LabView to automate testing. Gained experience with pressure, temperature and flow measurement and calibration.

University of Michigan

Jan 2002 – Apr 2006

EECS 425: Integrated Microsystems Laboratory

Ann Arbor, MI

Teaching Assistant

- Mentored the design, fabrication, and testing of circuits and microsystems based on EDNMOS and a silicon-on-glass dissolved wafer process. Communicated device issues and tradeoffs, validated designs, and supported simulation and testing.
- Assisted in the development of the multi-sensor process and the circuit and device fabrication.
- Occasionally assisted in presenting lectures.

Center for Wireless Integrated Microsystems

Jan 2002 – Dec 2004

Student Leadership Committee

Ann Arbor, MI

President and Vice President

- As president, oversaw all student activities within the WIMS center. Served as liaison between students and faculty, co-leading SLC-faculty meetings and communicating the conclusions to WIMS students. Motivated WIMS students to actively participate in education, outreach, and social events, fostering interaction and team growth within the center. As vice president, supported the president in all duties and responsibilities.

Mentor, Detroit Area Pre-College Engineering Program

- Mentored underrepresented minority students once a week over a six week period. Supported the students' work on programmable robots and discussed and taught basic science, encouraging their interest in WIMS and engineering.

Educational Chair

- Managed and coordinated all student education and outreach activities in the WIMS center. Collaborated with the Ann Arbor Hands-On Museum to develop a WIMS exhibit teaching the public about MEMS and their applications.

Compaq Computer Corporation

Mar 1998 – Sep 1999

Alpha Chipset Verification Group

Shrewsbury, MA

Computer Engineering Co-op

- Worked full-time on the Alpha Development Group's chipset verification team for two six-month periods between school quarters. Performed the verification, testing and coverage of the AGP, PCI, PCIX, and multiprocessor portions of the chipset. Acquired a thorough knowledge of the Alpha architecture, probability theory, the PCI and AGP protocols and multiprocessor theory. Communicated verification issues to chipset designers and worked with them to resolve problems.
- Designed and implemented MBTA, a software tool used to run and monitor multiple tests on multiple servers. Project duties included GUI design, CGI scripting and software programming and testing. Verified tool through rigorous component/function testing and "in-field" use.

- Nominated for a “Most Outstanding Intern” award for exceptional individual achievement.

Keithley Instruments

Jan 1997 – Dec 1998

4200-SCS Product Development Team

Solon, OH

Electrical and Computer Engineering Co-op

- Worked full-time during alternating quarters of school and work on the 4200-SCS product development team. The 4200-SCS is a wafer-level semiconductor characterization system.
- Designed the main control unit for a prototype arbitrary waveform generator for the 4200-SCS. This involved data transfer, memory interfacing, DAC control and timing analysis of a PCI-based FPGA design. Delivered a functional prototype of the device.
- Built and tested prototype circuits, including a step-down power supply and fan controller.
- Performed the thermal analysis and contributed to a thermally-efficient design for the 4200-SCS.
- Developed a low-current test suite in order to compare the performance of the 4200-SCS to several competitors. Utilized GPIB instrument control, GUI design and computer programming.

PEER-REVIEWED JOURNAL PUBLICATIONS

- M. J. Goudie, E. J. Brisbois, J. Pant, A. Thompson, **J. A. Potkay**, and H. Handa, “Characterization of an S-nitroso-N-acetylpenicillamine-based nitric oxide releasing polymer from a translational perspectives”, *International Journal of Polymeric Materials and Polymeric Biomaterials*, Vol. 65, No. 15, 2016, pp. 769-778, doi: 10.1080/00914037.2016.1163570.
- J. M. Trahanas, L. J. Witer, F. Alghanem, B. S. Bryner, A. Iyengar, J. R. Hirschl, M. J. Hoenerhoff, **J. A. Potkay**, R. H. Bartlett, A. Rojas-Pena, G. Owens, M. L. Bocks, “Achieving Twelve Hour Normothermic Ex situ Heart Perfusion: An Experience of Forty Porcine Hearts”, *ASAIO Journal*, 2016, doi: 10.1097/MAT.0000000000000382.
- **J. A. Potkay**, “Reply to the ‘Comment on “The promise of microfluidic artificial lungs”’ by G. Wagner, A. Kaesler, U. Steinseifer, T. Schmitz-Rode and J. Arens, *Lab Chip*, 2016, 16, DOI: 10.1039/C5LC01508A”, *Lab on a Chip*, Vol. 16, 2016, pp. 1274 - 1277.
- K. M. Kovach, M. A. LaBarbera, M. C. Moyer, B. L. Cmolik, E. van Lunteren, A. Sen Gupta, J. R. Capadona, **J. A. Potkay**, “In Vitro and In Vivo Evaluation of a Biomimetic, Hemocompatible, Microfluidic Artificial Lung”, *Lab on a Chip*, Vol. 15, 2015, pp. 1366 - 1375. (Citations: 5)
- **J. A. Potkay**, “The Promise of Microfluidic Artificial Lungs”, *Lab on a Chip*, Vol. 14, No. 21, 2014, pp. 4122 – 4138. (Citations: 7)
- K. Kovach, J. R. Capadona, A. Sen Gupta, and **J. A. Potkay**, “The Effects of PEG-Based Surface Modification of PDMS Microchannels on Long-Term Hemocompatibility,” *Journal of Biomedical Materials Research Part A*, Vol. 102, No. 12, 2014, pp. 4195-205. (Citations: 12)
- **J. A. Potkay**, “A simple, closed-form, mathematical model for gas exchange in microchannel artificial lungs,” *Biomedical Microdevices*, Vol. 15, No. 3, 2013, pp. 397-406. (Citations: 9)
- **J. A. Potkay** and K. D. Wise, “A Hybrid Thermopneumatic and Electrostatic Microvalve with Integrated Position Sensing,” *Micromachines*, Vol. 3, No. 2, 2012, pp. 379-395. (Citations: 4)
- **J. A. Potkay**, M. Magnetta, A. Vinson, and B. Cmolik, “Bio-inspired, efficient, artificial lung employing air as the ventilating gas,” *Lab on a Chip*, Vol. 11, No. 17, 2011, pp. 2901 - 2909. (Citations: 26)
- **J. A. Potkay**, “Long term, implantable blood pressure monitoring systems,” *Biomedical Microdevices*, Vol. 10, No. 3, June 2008, pp. 379-392. (Citations: 65)
- **J. A. Potkay**, G. R. Lambertus, R. D. Sacks, and K. D. Wise, “A Low Power Pressure- and Temperature-Programmable Micro Gas Chromatography Column,” *IEEE Journal of Micro Electro Mechanical Systems (JMEMS)*, Vol. 16, No. 5, Oct. 2007, pp. 1071-1079. (Citations: 67)
- M. Agah, **J. A. Potkay**, G. R. Lambertus, R. D. Sacks, and K. D. Wise, “High-Performance Temperature-Programmed Microfabricated Gas Chromatography Columns,” *IEEE Journal of Micro Electro Mechanical Systems (JMEMS)*, Vol. 14, No. 5, 2005, pp. 1039-1050. (Citations: 113)

- C.-J. Lu, W. H. Steinecker, W.-C. Tian, M. Agah, **J. A. Potkay**, M. C. Oborny, J. Nichols, H. Chan, J. Driscoll, R. D. Sacks, S. W. Pang, K. D. Wise, and E. T. Zellers, "First Generation Hybrid MEMS Gas Chromatograph," *Lab on a Chip*, Vol. 5, 2005, pp. 1123-1131. (Citations: 209)
- G. Lambertus, A. Elstro, K. Sensenig, **J. A. Potkay**, M. Agah, S. Scheuering, K. D. Wise, F. Dorman, and R. D. Sacks, "Design, Fabrication, and Evaluation of Microfabricated Columns for Gas Chromatography," *Analytical Chemistry*, v 76, n 9, Boston, Mass., May 1, 2004, pp. 2629-2637. (Citations: 139)

CONFERENCE PUBLICATIONS

- S Majerus, J Dunning, **J. A. Potkay**, K M Bogie, "Flexible, structured MWCNT/PDMS sensor for chronic vascular access monitoring" *2016 IEEE Sensors Conference*, Orlando, FL, Oct 30 – Nov 2, 2016. Accepted for oral presentation.
- A. Vinson and **J. A. Potkay**, "Self-formed, naturally-optimized microfluidic channels in polydimethylsiloxane (PDMS)," *Technical Digest of the Solid-State Sensors, Actuators and Microsystems Workshop (Hilton Head)*, Hilton Head Island, SC, June 3-7, 2012, pp. 243-246. Poster presentation. (Poster acceptance rate: 89 out of 252 submissions)
- **J. A. Potkay**, "A high efficiency micromachined artificial lung," *The 15th International Conference on Solid-State Sensors, Actuators and Microsystems (Transducers 2009)*, Denver, Colorado, June 2009, pp. 2234-2237. **Oral presentation.** (Oral acceptance rate: 216 out of 1306 submissions)
- **J. A. Potkay** and K. R. Brooks, "An arterial cuff energy scavenger for implanted microsystems," *The 2nd International Conference on Bioinformatics and Biomedical Engineering (ICBBE2008)*, Shanghai, China, May 16-18, 2008, pp. 1580-1583. Poster presentation.
- E.T. Zellers, S. Reidy, R.A. Veeneman, R. Gordenker, W.H. Steinecker, G.R. Lambertus, H. Kim, **J. A. Potkay**, M.P. Rowe, Q. Zhong, C. Avery, H.K.L. Chan, R.D. Sacks, K. Najafi, and K.D. Wise, "An Integrated Micro-Analytical System for Complex Vapor Mixtures," *Solid-State Sensors, Actuators and Microsystems Conference (Transducers 2007)*, Lyon, France, June 10-14, 2007, pp. 1491 – 1496.
- **J.A. Potkay**, G. R. Lambertus, R. D. Sacks, and K. D. Wise, "A Low-Power Temperature- and Pressure-Programmable μ GC Column," *Solid-State Sensors, Actuators and Microsystems Workshop (Hilton Head)*, Hilton Head Island, SC, June 4-8, 2006, pp. 144-147. Poster presentation. (Poster acceptance rate: 66 out of 205 submissions)
- **J. A. Potkay** and K. D. Wise, "An Electrostatically Latching Thermopneumatic Microvalve with Closed-Loop Position Sensing," *Proceedings of the Eighteenth Annual IEEE Conference on Micro Electro Mechanical Systems (MEMS)*, Miami, Florida, January 2005, pp. 415-418. Poster presentation. (Poster acceptance rate: 176 out of 750 submissions)
- M. Agah, **J. A. Potkay**, A. Elstro, G. Lambertus, R. D. Sacks, and K. D. Wise, "A High-Performance Temperature-Programmed Gas Chromatography Column," *Proceedings of the Solid-State Sensors, Actuators, and Microsystems Workshop*, Hilton Head Island, SC, June 6-10, 2004, pp. 302-305.
- E. T. Zellers, W. H. Steinecker, G. R. Lambertus, M. Agah, C. -J. Lu, H. K. Chan, **J. A. Potkay**, M. C. Oborny, J. Nichols, A. Astle, H. Kim, M. P. Rowe, J. Kim, L. W. Da Silva, J. Zheng, J. Whiting, R. D. Sacks, S. W. Pang, M. Kaviani, P. L. Bergstrom, A. J. Matzger, J. Kurdak, L. P. Bernal, K. Najafi, and K. D. Wise, "A Versatile MEMS Gas Chromatograph for Environmental Vapor Mixture Analysis," (Invited) *Proceedings of the Solid-State Sensors, Actuators, and Microsystems Workshop*, Hilton Head Island, SC, June 6-10, 2004, pp. 61-66.
- E. T. Zellers, K. D. Wise, H. K. Chan, S. W. Pang, L. W. Da Silva, M. Kaviani, J. Kim, C. Kurdak, Y. Lu, D. M. Aslam, J. Zheng, M. Agah, **J. A. Potkay**, J. Zhong, M. C. Oborny, W. H. Steinecker, J. Nichols, M. P. Rowe, A. J. Matzger, G. R. Lambertus, A. Elstro, J. Whiting, R. D. Sacks, and P. L. Bergstrom, "Materials and Processing Challenges Related to the Fabrication of a MEMS Micro Gas Chromatograph," *Symposium on Materials, Mechanisms, and Systems for Chemical and Biological Detection and Remediation*, San Francisco, CA, April 2004.
- M. Agah, **J. A. Potkay**, J. A. Driscoll, R. D. Sacks, M. Kaviani, and K. D. Wise, "Thermal Behavior of High-Performance Temperature-Programmed Microfabricated Gas Chromatography Columns," *Technical Digest of the 12th International Conference on Solid-State Sensors*, Boston, MA, June 8-12, 2003, pp. 1339-1342.

- **J. A. Potkay**, J. A. Driscoll, M. Agah, R. D. Sacks, and K. D. Wise, "A High-Performance Microfabricated Gas Chromatography Column," *Proceedings of the Sixteenth Annual IEEE Conference on Micro Electro Mechanical Systems (MEMS)*, Kyoto, Japan, January 19-23, 2003, pp. 395-398. Poster presentation.
- Edward T. Zellers, K. D. Wise, K. Najafi, D. Aslam, R. B. Brown, Q. Y. Cai, J. Driscoll, M. Flynn, J. Giachino, R. Gordenker, M. D. Hsieh, C. T.-C. Nguyen, P. Bergstrom, J. Drelich, C. Friedrich, E. Gamble, M. Kaviany, C. J. Lu, A. Matzger, M. Oborny, S. Pang, **J. A. Potkay**, R. Sacks, W.-C. Tian, W. Steinecker, J. Whiting, Q. Zhong, "Determinations of Complex Vapor Mixtures in Ambient Air with a Wireless Microanalytical System: Vision, Progress, and Homeland Security Applications," *Technical Digest of the IEEE Conference on Technologies for Homeland Security*, Waltham MA, IEEE, Boston, pp. 92-95, November 13-14, 2002.

PRESENTED CONFERENCE ABSTRACTS

- M. Goudie, E. Brisbois, J. Pant, A. Thompson, J. Potkay, H. Handa, "Sterilization, Storage Stability, Physical and Biological Properties of an S-nitroso-N-acetylpenicillamine-Based Nitric Oxide Releasing Polymer", BMES 2016, Minneapolis, MN, Oct. 5-8, 2016, *poster presentation - accepted*.
- A. Thompson, M. Goudie, H. Handa, A. Rojas-Pena, **J. A. Potkay**, "Rolled Construction and Scalable Design of Cylindrical Microfluidic Artificial Lungs," ASAIO 2016, San Francisco, CA, June 15-18, 2016, *oral presentation*.
- A. Thompson, M. Goudie, H. Handa, A. Rojas-Pena, **J. A. Potkay**, "Scalable Design and Rolling Fabrication of Cylindrical Microfluidic Artificial Lungs," Wireless Integrated MicroSensing and Systems (WIMS²) Industrial Advisory Board Meeting, Ann Arbor, MI, May 18, 2016, *poster presentation*.
- A. Thompson, M. Goudie, H. Handa, A. Rojas-Pena, **J. A. Potkay**, "Scalable Design and Rolling Fabrication of Cylindrical Microfluidic Artificial Lungs," Microfluidics in Biomedical Sciences Training Program Annual Symposium, Ann Arbor, MI, May 4, 2016, *poster presentation*.
- J. Wang, **J. A. Potkay**, and E. T. Zellers, "Micro-Scale Vapor Extractor for Micro-GC Analysis of VOCs in Biofluids," PITTCON 2016, Atlanta, GA, March 6-10, 2016.
- J. Wang, **J. Potkay**, E.T. Zellers, "Microfabricated Vapor Extractor Chip for Micro-Scale Gas Chromatographic Analysis of VOCs in Water and Biofluids", Oral Presentation, ANACHEM/SAS Symposium, Livonia, MI, November, 2015.
- J. Wang, **J. Potkay**, E.T. Zellers. "A Micro-Scale Vapor Extractor (μ VE) for μ GC Analysis of VOCs in Aqueous Media" Poster Session, The Karle Symposium, Ann Arbor, MI, August, 2015
- J. Wang, E.T. Zellers, **J. Potkay**, "A Micro-Scale Vapor Extractor (μ VE) for μ GC Analysis of VOCs in Water and Biofluids" Poster Session, Center for Wireless Integrated MicroSensing & Systems, University of Michigan, Ann Arbor, MI, May, 2015
- K. M. Kovach, J. R. Capadona, A. Sen Gupta, and **J. A. Potkay**, "Post-Assembly PEGylation of a PDMS microchannel for enhancing hemocompatibility," Biomedical Engineering Society (BMES) Annual Meeting, Seattle, WA, Sept 25-28, 2013.
- K. Kovach, J. Capadona, A. Sen Gupta, and **J. Potkay**, "Post-Assembly PEGylation of a PDMS Microchannel for Enhancing Hemocompatibility," Research ShowCase, Case Western Reserve University, Apr 12-13, 2013.
- A. Vinson, M. Magnetta, and **J. Potkay**, "Advanced Medical Microsystems Laboratory," Research Week, L. Stokes Cleveland VA Medical Center, Cleveland, OH, 2011.
- S. Shah and **J. Potkay**, "Developing and Implantable Occlusion Sensor for Vascular Grafts," Irwin H. Lepow Day, Cleveland, OH, 2010. **Awarded "Best Research Poster"**.
- **J. Potkay**, "Advanced Medical Microsystems Laboratory," Research Week, L. Stokes Cleveland VA Medical Center, Cleveland, OH, 2010.
- **J. Potkay**, "Microfabricated Artificial Lungs for Veteran Rehabilitation," Research ShowCase, Case Western Reserve University, 2010.
- S. Shah and **J. Potkay**, "Developing and Implantable Occlusion Sensor for Vascular Grafts," Research ShowCase, Case Western Reserve University, 2010.
- **J. Potkay**, "High Efficiency, Micromachined Artificial Lung", VA National Research Week, Washington, D.C., 2009.

- **J. Potkay**, “A High Efficiency Microfabricated Artificial Lung,” Research ShowCase, Case Western Reserve University, 2009.
- **J. A. Potkay** and K. Brooks, “Flexible, Implantable Pressure Sensors for Functional Electrical Stimulation Systems,” *The 38th Neural Interfaces Conference (NIC 2008)*, Cleveland, OH, June 16-18, 2008. Poster presentation.
- **J. Potkay**, “An Arterial Cuff Energy Harvester for Implanted Microsystems,” Research ShowCase, Case Western Reserve University, 2008.

RESEARCH GRANTS - AWARDED

- “Passive Micro-Sampler with Facilitated On-Site Analysis for Multi-Vapor Worker Exposure Monitoring”, 2016 University of Michigan Center for Occupational Health & Safety Engineering (COHSE) NIOSH Pilot Project Research Training Program (PPRT), 7/1/2016 – 6/30/2017, \$17,200, **Co-Principal Investigator**.
- “Toward portable microchannel artificial lungs for veteran rehabilitation”, Rehabilitation R&D Merit Review Award, Department of Veterans Affairs, 4/1/2015 – 3/31/2018, \$824,944, **Principal Investigator**.
- “Microsystem Technology for On-Site Biological Monitoring of Occupational VOC Exposures”, 2014 University of Michigan Center for Occupational Health & Safety Engineering (COHSE) NIOSH Pilot Project Research Training Program (PPRT), 7/1/2014 – 6/30/2015, \$19,983, **Principal Investigator**.
- “A Universal MEMS Interface for μ GC Analysis of Volatile Water Contaminants and Disease Biomarkers”, 2014 University of Michigan WIMS² Seedling Program, 6/1/2014 – 9/31/2015, \$27,000, **Principal Investigator**.
- “Ex vivo Characterization of a Microfabricated Artificial Lung”, Rehabilitation R&D Merit Review Award, Department of Veterans Affairs, 4/1/2011 – 3/31/2014, \$828,635, **Principal Investigator**.
- “Nanoporous Polymer Membranes for Portable Artificial Kidneys”, VISN 10 Research Initiative Program, Department of Veterans Affairs, 9/1/2011 – 8/31/2012, \$10,000, **Principal Investigator**.
- “Instrumented Vascular Grafts for Advanced Detection of Impending Graft Failure”, The Cleveland VA Medical Research and Education Foundation, 12/1/2009 – 12/30/2011, \$25,000, **Principal Investigator**.
- “Acute and Chronic Performance of an Implanted Power Source”, Rehabilitation R&D Career Development Award, Department of Veterans Affairs, 4/1/2009 – 3/31/2011, \$193,600, **Principal Investigator**.
- “A High Efficiency, Micromachined Artificial Lung,” VISN 10 Research Initiative Program, Department of Veterans Affairs, 10/1/2007 – 9/30/2008, \$10,000, **Principal Investigator**.
- “March Plasma Systems CS1701F RIE Plasma System”, Advanced Platform Technology Center Large Equipment Grant, Rehabilitation R&D, Department of Veterans Affairs, 5/16/2008, \$73,415, **Co-Investigator and author**.

RESEARCH GRANTS - PENDING

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RESEARCH COLLABORATORS

- Jeffrey Capadona, Ph.D., Assistant Professor of Biomedical Engineering, Case Western Reserve University
- Edward Zellers, Ph.D., Professor, Environmental Health Sciences and Chemistry, University of Michigan
- Hitesh Handa, Ph.D., Assistant Professor, Engineering, University of Georgia
- Alvaro Rojas-Pena, M.D., Research Investigator, Surgery, University of Michigan
- Robert Bartlett, M.D., Professor Emeritus, Surgery, University of Michigan
- Anirban Sen Gupta, Ph.D., Assistant Professor of Biomedical Engineering, Case Western Reserve University
- Keith Cook, Ph.D., Associate Professor, Biomedical Engineering, Carnegie Mellon
- Brian Cmolik, M.D., Section Chief of Cardio Thoracic Surgery, L. Stokes Cleveland VA Medical Center
- Erik van Lunteren, M.D., Pulmonary Physician, L. Stokes Cleveland VA Medical Center

IN THE NEWS

- Dolgin, Elie. "Artificial Inspiration." [Article and interview]. *Nature*. Vol. 481, pp. S12-S14, 27 Sept 2012. < http://www.nature.com/nature/journal/v489/n7417_supp/pdf/489S12a.pdf>
- "Artificial lung design mimics nature." [Article and interview]. *VA Research Currents*. Sept 2011. < http://www.research.va.gov/resources/pubs/docs/va_research_currents_sept_11.pdf>
- Smock, Doug. "Artificial lung is microfluidics marvel." [Article and interview]. *Design News*. 04 Aug 2011. < http://www.designnews.com/author.asp?section_id=1392&doc_id=231870>
- Potkay, Joseph. Live interview with Randi Kaye. *The Big I. CNN*. 2 August 2011.
- Potkay, Joseph. Interview with Stacy Lipson. *Smart Planet. CBS Interactive*. 27 July 2011. < <http://www.smartplanet.com/blog/rethinking-healthcare/new-artificial-lung-breathes-like-a-real-one/5897>>.
- Potkay, Joseph. Live interview with John Dankowsky. *Where We Live. Connecticut Public Radio*. WNPR, Hartford. 27 July 2011.
- Case Western Reserve University. (2011). Artificial lung mimics real organ's design and efficiency [Press release]. Retrieved from http://www.eurekalert.org/pub_releases/2011-07/cwru-alm072511.php. (This press release was re-published by over 100 online news sites across the world including **CNET**, **Popular Science**, **PC World**, **ZDNet**, **Gizmag**, **Slashdot**, and **Science Daily**.)
- Sheahan, Holly. "No more oxygen for artificial lung." *Chemistry World*. 14 July 2011. < <http://www.rsc.org/chemistryworld/News/2011/July/14071101.asp>>.

PATENTS

- **J. A. Potkay**, "In Situ Energy Harvesting Systems for Implanted Medical Devices," U.S. Provisional Application No. 61/170,102, April 16, 2009.
- K. D. Wise and **J. A. Potkay**, "Thermopneumatic Microvalve," U.S. Patent 7,192,001, Mar 20, 2007.
- K. D. Wise, R. D. Sacks, K. T. Beach, **J. A. Potkay**, and M. Agah, "Separation Microcolumn Assembly for a Microgas Chromatograph and the Like," U.S. Patent 6,838,640, Jan 4, 2005.

INVENTION DISCLOSURES

- **J. A. Potkay**, "3D printed microfluidic artificial lung," VHA Invention # 2016-117, May 3, 2016.
- **J. A. Potkay** and E. Zellers, "A microsystem to extract volatile compounds from liquid media," University of Michigan Invention # 6260, May 30, 2014.
- **J. A. Potkay**, "Manufacturing technology to create large area microfluidic devices," VHA Invention 2014-274, Sept 15, 2014.
- **J. A. Potkay** and J. R. Capdona, "Nanoporous polymer membrane based on polymer-nanocomposite technology," VHA Invention #12-262, June 7, 2012.
- **J. A. Potkay**, "Highly integrated multi-layer microfluidics," VHA Invention #12-189, Feb. 27, 2012.
- **J. A. Potkay**, "A method to simply and efficiently improve the mechanical biocompatibility of microfluidic channels," VHA Invention #12-188, Feb. 27, 2012.
- **J. A. Potkay**, Ronald J. Triolo, and Gilles Pinault, "Smart, instrumented vascular grafts," Submitted to VHA, June 29, 2009.
- **J. A. Potkay**, "An implantable, pressure-based, hybrid energy harvesting microsystem," VHA Invention #09-106, Aug 14, 2009.
- **J. A. Potkay**, "A high-efficiency, micromachined artificial lung," VHA Invention #07-134, July 12, 2007.
- **J. A. Potkay**, "Miniature, Flexible, Biocompatible Sensor Arrays," VHA Invention #07-133, July 12, 2007.
- **J. A. Potkay**, "A Miniature, Flexible, Arterial Cuff for Implantable Power Generation," VHA Invention #08-080, Apr. 8, 2008.

INVITED SEMINARS

- **J. A. Potkay**, "The Promise of Microchannel Artificial Lungs," *Microfluidics in Biomedical Sciences Training Program Seminar Series, University of Michigan*, Ann Arbor, MI, January 13, 2014.
- **J. A. Potkay**, "Advanced Medical Microsystems for Veteran Health," *Department Colloquium, Electrical Engineering and Computer Science, Case Western Reserve University*, Cleveland, OH, March 30, 2010.

- **J. A. Potkay**, "Next generation, portable artificial lungs using micro- and nano-technologies," *Research Conference of the Division of Pulmonary and Critical Care Medicine*, Case Western Reserve University, Cleveland, OH, Feb. 3, 2010.
- **J. A. Potkay**, "Low power, fast, micro gas chromatography columns," *EECS 438, Case Western Reserve University*, Cleveland, OH, Nov 14, 2006.
- **J. A. Potkay**, "A low power pressure- and temperature-programmed separation system for a micro gas chromatograph," *Cleveland Functional Electrical Stimulation (FES) Center Seminar Series*, Cleveland, OH, June 22, 2006.

PROFESSIONAL ACTIVITIES

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| • Research and Development Committee Member, VA Ann Arbor Healthcare System | 2015-present |
| • Committee Member, Leadership Team, Advanced Platform Technology Center | 2011-present |
| • Grant reviewer, NIH Bioengineering R15 Academic Research Enhancement Award | July 2016 |
| • Grant reviewer, VA RRDS, Small Projects in Rehabilitation Research | Spring, Fall 2015 |
| • Grant reviewer, Innovation Incentive Grant, VA Advanced Platform Technology Center | 2012, 2014 |
| • Committee Member, Professional Standards Board, Cleveland VA Medical Center | 2008-2012 |
| • Grant reviewer for R&D Committee, Cleveland VA Medical Center | 2008-2012 |
| • Participant, Lower Limb Amputee Needs Assessment Workshop, Seattle, WA | October 2007 |
| • Participant, Wheelchair Tutorial by Dr. Richard Simpson, Cleveland VA Medical Center | October 2007 |
| • Technical Reviewer, EMBS IEEE EMBS Micro and Nanotechnology in Medicine Conference | 2014 |
| • Technical Reviewer, Analyst | 2014 |
| • Technical Reviewer, IEEE Journal of Micro Electro Mechanical Systems (JMEMS) | 2007-present |
| • Technical Reviewer, IEEE Transactions on Biomedical Engineering (TBME) | 2007-present |
| • Technical Reviewer, Sensor Letters | 2008-present |
| • Technical Reviewer, International Journal of Telemedicine and Applications | 2010-present |
| • Technical Reviewer, Lab on a Chip | 2011-present |
| • Technical Reviewer, Biomicrofluidics | 2012-present |
| • Technical Reviewer, Biomedical Microdevices (BMMD) | 2012-present |
| • Technical Reviewer, Micromachines | 2015-present |
| • Technical Reviewer, ACS Applied Materials & Interfaces | 2015-present |
| • Technical Reviewer, The Engineering in Medicine and Biology Conference (EMBC) | 2011-present |
| • Technical Reviewer, IEEE Biomedical Circuits and Systems Conference (BioCAS) | 2011 |
| • Technical Reviewer, IEEE Journal on Emerging and Selected Topics in Circuits and Systems | 2011 |
| • Technical Reviewer, Chemical Engineering Research and Design | 2013 |
| • Professional Memberships: IEEE, EMBS, ASAI0 | |

HONORS AND AWARDS

- | | |
|--|-----------|
| • Artificial lung work listed as one of seven notable research accomplishments in VA history by VA Chief of Staff in a VA-wide email | Nov 2015 |
| • Best Research Poster, Wireless Integrated Microsensing & Systems (WIMS2) Spring IAB Meeting | 2015 |
| • Interviewed by CNN, Public Radio, Nature Magazine, et al. regarding Artificial Lung Research | 2011-2012 |
| • Featured Research Project for September, Veterans Health Administration R&D Web Page | 2011 |
| • Presidential Early Career Award for Scientists and Engineers, Cleveland VA RR&D Nominee | 2011 |
| • Rehabilitation R&D Career Development Award, Department of Veterans Affairs | 2009-2011 |
| • Featured Investigator of the Year, Advanced Platform Technology (APT) Center – A VA Research Center of Excellence, Cleveland, OH | 2011 |
| • Best Research Poster Award, Irwin H. Lepow Student Research Day, CWRU | 2010 |
| • VA VISN10 Post-Doctoral Fellowship | 2006-2008 |
| • Top Reviewer, Journal of Micro Electro Mechanical Systems | 2007 |
| • Excellence in Engineering Fellowship Recipient, Sandia National Labs | 2004-2006 |

- Research Fellow, Electrical Engineering Department, U. of Michigan 2000-2006
- Second Place, Design Contest, EECS 598: Analog to Digital Conversion Circuits 2002
- Valedictorian, Computer Engineering, U. of Cincinnati 2000
- Vorheis Scholarship recipient, U. of Cincinnati 1995-2000
- Babcock & Wilcox Scholarship recipient, U. of Cincinnati 1999-2000
- First Place, Senior Project Design Contest, U. of Cincinnati 2000
- Ohio Academic Scholarship recipient 1995
- Honor Societies: TBP, HKN, National Honor Society

MENTORING

- Lindsay Ma, Undergraduate researcher, "Biologic considerations for microfluidic artificial lungs," 08/2016-present, Primary mentor.
- Thomas Plegue, Undergraduate researcher, "Protein resistant surface coatings for PDMS," 06/2016-present, Primary mentor.
- Lucas Marks, Undergraduate researcher, "Laser machined molds for large area microfluidic networks," 06/2016-present, Primary mentor.
- Alex Thompson, Post-doctoral researcher, "Toward portable microfluidic artificial lungs for pulmonary rehabilitation," 07/2015-present, Primary mentor.
- Junqi Wang, University of Michigan Chemistry Ph.D. student, "Design and testing of a microsystem to extract volatile compounds from liquid media," 06/2014-present, Co-mentor (Primary mentor: E. Zellers).
- Changhua Zhan, University of Michigan Chemistry Ph.D. student, "Fabrication of a Microsystem Technology for On-Site Biological Monitoring of Occupational VOC Exposures," 09/2014-present, Co-mentor (Primary mentor: E. Zellers).
- Marcus Goudie, Ph.D. student – University of Georgia, "Synergistic effect of nitric oxide release and protein resistant coating on hemocompatibility of microfluidic artificial lungs," 07/2014-present, Co-mentor (Primary mentor – H. Handa).
- Kyle Kovach, M.S., Cleveland VA Medical Center Biomedical Engineer, "Blood compatible surface modifications for microchannel artificial lungs," 05/2011-10/2014, Primary manager.
- Michael LaBarbera, CWRU EECS Ph.D. student, "Micro- and nano- technologies for portable artificial kidneys," 05/2012-07/2014, Primary mentor.
- Michael Suster, CWRU EECS post-doctoral researcher, "A high frequency dielectric spectroscopy biosensor," 11/2011-06/2012, Co-mentor (Primary mentor: P. Mohseni).
- Michael Magetta, CWRU School of Medicine research program, "Construction and gas exchange optimization of a microfabricated artificial lung," 06/2010-05/2011, Primary mentor.
- Abigail Vinson, CWRU School of Medicine research program, "Testing and biocompatibility of microfabricated artificial lungs," 06/2010-03/2012.
- Sareen Shah, CWRU School of Medicine research program, "Instrumented vascular grafts for advanced detection of impending graft failure," 06/2009-05/2012, Primary mentor.

VOLUNTEER WORK

- Participant and fundraiser, Cleveland Kidney Walk, 2011, National Kidney Foundation
- Participant, Great Strides – Cleveland Metroparks Zoo, 2011, Cystic Fibrosis Foundation
- Participant, Lake Erie Classic Charity Fishing Tournament to benefit the Cystic Fibrosis Foundation, 2008 - 2013

REFERENCES

1. **William (Rick) Weitzel, MD** VA Ann Arbor Healthcare System
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William Gould Dow Distinguished University Professor Emeritus
 2402 EECS Bldg., 1301 Beal Avenue, Ann Arbor, MI 48109-2122
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CITIZENSHIP

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